



Model 1000
MUTUAL CONDUCTANCE TUBE TESTER

INSTRUCTION MANUAL

MERCURY
ELECTRONICS CORP.

manufacturers of quality electronic products

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MERCURY ELECTRONICS CORP.
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The Mercury Model 1000 introduces a new concept in Dynamic Mutual Conductance tube testing. A combination of lever-switch versatility and multiple-socket speed brings a true Mutual Conductance (Gm) tube tester into the popular-price range for the first time.

The Model 1000 tests for shorts between any tube elements. The 2-color GAS scale on the meter shows grid leakage and gas content with a sensitivity of over 150 megohms. Tubes such as rectifiers, power amplifiers, etc. are checked for Dynamic Cathode Emission (Em), with tube quality shown on the 3-color meter scale.

The Model 1000 circuit is designed for maximum speed and accuracy in testing. During normal test procedure no damage to tubes or to the tester can occur. There is automatic compensation built in, thus avoiding need for a line-adjust control, and the entire instrument is line isolated for safety and long life.

THE PANEL AND CONTROLS

There are thirteen 3-position levers which are normally left in the lower position, marked "K". Levers 1 through 10 represent corresponding tube elements. The heater circuits are independent, thus removing the need for an "open" position usually found in lever switch circuits. Levers 11 through 13 control the Grid, Heater Return and Plate circuits, respectively. Need for a separate bias control is eliminated since this is automatically accomplished by the setting of the Grid circuit lever. The Plate circuit lever automatically selects the proper plate and screen voltage, enabling the Model 1000 to test all tubes including gas tubes, battery types, high voltage types, etc.

The SELECTOR knob provides 12 heater voltage settings, which cover all tubes in use today. The LOAD control adjusts meter sensitivity. The FUNCTION switch sets up the tests in proper sequence, and also serves as the POWER switch.

The POWER jewel shows when the instrument is turned on, and the SHORTS jewel is used to detect inter-element shorts up to 1 megohm.

The modern 4½ inch meter has a dual-range "Gm" scale which enables dynamic mutual conductance to be measured over a range of 0-5000 micromhos or 0-25,000 micromhos.

The 3-color "Em" scale measures dynamic cathode emission of tube types where no Gm test can be made, or where cathode emission is recommended as of more significance. This scale is also used to test picture tubes. A mark labeled "Diodes O.K." provides a quality test of low output diodes.

The 2-color "GAS" scale measures the tendency of a tube to have grid emission due to gas. This circuit has over 150 megohm sensitivity and is highly reliable as a means of catching faulty performance due to tube gassy condition.

The tube chart provides automatic guidance as to which test is to be made, and which meter scale is to be read.

The panel also contains 13 sockets plus 7-and 9-pin straighteners. Included are the new 12-pin Compaction, 10-pin, Nova, and Nuvistor sockets, making the Model 1000 completely up-to-date.

The case is compact and lightweight, finished in smart gray leatherette. Included is a picture tube test cable, a full eight-foot line cord, tube chart and instruction manual.

TEST INSTRUCTIONS

Preliminary

Tests are generally made following clockwise sequence of the FUNCTION switch positions:

- a) Initial set-up, as given on the tube chart, is made with the FUNCTION switch at "OFF" or at "SHORTS".
- b) After insertion of the tube, the FUNCTION switch is advanced to the "SHORTS" position, and the tube is tested for inter-element shorts according to the instructions entitled "Test for Shorts".

- c) Leaving the FUNCTION SWITCH at "SHORTS" position, set levers for "Gm" or "Em" test — then advance the FUNCTION switch to "Gm-Em" and read the designated meter scale for tube quality.
- d) Leaving the FUNCTION switch at "Gm-Em", set levers for GAS test — then advance FUNCTION switch to "GAS-GRID LEAKAGE" position, and read the meter "GAS" scale.
- e) Re-set all levers to the "K" position (unless directed to do otherwise in "NOTES" column of tube chart) and rotate FUNCTION switch back to "SHORTS" position before testing next tube.

NOTE If the above sequence is observed in making all tube tests, danger of damage to the meter will be avoided, which might occur if the FUNCTION switch is advanced to "Gm-Em" or to "GAS" position before the levers are properly set, or if the FUNCTION switch is inadvertently left at either of these positions at the start of the next test.

TEST FOR SHORTS

1. See that all levers are at position "K" unless otherwise directed in tube chart column entitled "NOTES". FUNCTION switch may be at "OFF" or at "SHORTS" position.
2. Referring to tube chart, find listing of tube to be tested, and set SELECTOR and LOAD as indicated in first two columns.
3. Advance FUNCTION switch to "SHORTS" position (if it is not already there), insert tube in designated socket, and allow 10-second warm-up.
4. Observe SHORTS indicator lamp during the following procedure:
 - a) Using levers 1 through 10 only, move levers one at a time to "G", then back to "K".
 - b) A steady indicator glow when any lever is at "G" means the tube is shorted, except where lever number is listed in SHORTS column, in which case a glow is O.K.

5. **Inter-Element Shorts** The tube pin number is the same as the lever number.* For example, if a glow obtained when lever 5 is moved to "G", and again when lever 8 is moved to "G", then tube pins 5 and 8 are internally shorted to each other. If further investigation is desired, use any tube manual to identify these elements. If the tube is a 6K6, this would represent a short between control grid and cathode (G₁-K).
6. **Heater-Cathode (H-K) Shorts** If a glow obtained only when cathode lever is moved to "G", the tube has a heater-to-cathode short. (Heaters are independent of the lever switches). The cathode lever can be identified for any particular tube by referring to a tube manual.
7. If tube is shorted, reject it without further test.

*Socket S has pin 11 connected to lever 1 and top cap is connected to lever 10.

TEST FOR MUTUAL CONDUCTANCE (G_m)

1. After completing SHORTS test, refer to tube chart columns entitled "G_m-E_m", and "Rated G_m". If a value is listed under "Rated G_m", the tube will be tested for transconductance using the following procedure. If there is no listing in the "Rated G_m" column, the tube is to be tested for Dynamic Emission (E_m), using the procedure of the next section, entitled "TEST FOR EMISSION (E_m)".
2. Levers should be set to "G" and/or to "P", as directed in column labeled "G_m-E_m".
3. Advance FUNCTION switch to "G_m-E_m" position and observe meter Hi Scale (0-25,000 range). Mutual conductance in micromhos should be within 20% of rated value as listed in column entitled "Rated G_m". If a double asterisk (**) appears next to G_m value listing, use meter Lo-Scale (0-5000 range).

NOTE: If G_m reads a little more than 20% outside of rated value, the technician should use his judgement whether to replace the tube: extra-high G_m should do no harm; extra-low G_m means a sub-standard tube that might still be useful in a non-critical circuit.

TEST FOR EMISSION (Em)

1. Where no value is listed in the column entitled "Rated Gm", the tube will be tested for dynamic emission.
2. With FUNCTION switch still in "SHORTS" position, set levers to "G" and/or to "P", as directed in column labeled "Gm-Em".
3. Advance FUNCTION switch to "Gm-Em" position and read tube Quality on 3-color GOOD-WEAK-BAD scale entitled "EM". Diode Quality is good if meter reads over the line entitled "Diodes O.K.". Diodes are identified on the tube chart by a single asterisk (*) next to the listing in the first column entitled "TUBE".
4. Return all levers to "K".

TEST FOR GAS

1. If no listing is given in tube chart column entitled "GAS", the test of your tube has been completed. If a listing appears in the "GAS" column, proceed as follows
2. With FUNCTION switch still in the "Gm-Em" position, set appropriate levers to "G", as directed in column entitled "GAS".
3. Advance FUNCTION switch to "GAS-GRID LEAKAGE" position and observe meter 2-color scale entitled "GAS". If tube is good there should be little or no meter movement. If meter reads anywhere in the Green Area at the left end of the scale, tube has some gassiness but is acceptable. If meter reads anywhere in Red area, tube should be rejected as sub-standard.
4. Return all levers to "K". Return FUNCTION switch to "SHORTS" position before testing next tube.

NOTE: Tubes with more than one listing are multiple-section tubes. A separate test should be made for each section.

PICTURE TUBE TEST

1. The picture tube test cable included with the Model 1000 has sockets for the standard duodecal (12-pin) and 8-pin narrow-neck 1J0⁰ type tubes. These two bases comprise practically all of the picture tubes you will be called upon to test.
2. Since all picture tubes are tested for emission in the same manner, no chart of picture tubes is required.
3. With FUNCTION switch at "SHORTS" position,
set SELECTOR at "D" for standard 6.3 volt heaters
set SELECTOR at "C" for 4.7 volt heaters
set SELECTOR at "B" for 2.58 volt heaters
set SELECTOR at "E" for 8.4 volt heaters

NOTE For the very few types which use other than the standard 6.3 volt heaters, refer to any of the manufacturer's CRT rating charts, available at all parts jobbers.

4. Set load to 70.
5. Test for inter-element shorts, following procedure of section entitled "TEST FOR SHORTS", on page 5.
6. Set levers 2, 6 and 10 to "G"; set lever 11 to "P".
7. Advance FUNCTION switch to "Gm-Em" and read picture tube Quality on 3-color GOOD-WEAK-BAD scale labeled "Em".
8. Return levers to "K".
9. Set lever 2 to "G".
10. Advance FUNCTION switch to "GAS-GRID LEAKAGE", and observe meter scale entitled "GAS". If meter reads anywhere in red portion of scale, CRT is gassy. It may still function for a time, but will be subject to "negative" picture effect on strong contrast settings. A gassy picture tube should be replaced.

MODEL 1000 PARTS LIST

Item	Description
R ₁	100 Ohm Trimmer Pot.
R ₂	220 Ohm Resistor 1/2 Watt 1%
R ₃	560 Ohm Resistor 1/2 Watt 1%
P ₄	5K Ohm Trimmer Pot.
R-5	10K Ohm Resistor 1/2 Watt 10%
R-6	47K Ohm Resistor 1/2 Watt 10%
R-7	820K Ohm Resistor 1/2 Watt 10%
R-8	4.7M Ohm Resistor 1/2 Watt 10%
R-9	6.8M Ohm Resistor 1/2 Watt 10%
R-10	22M Ohm Resistor 1/2 Watt 10%
R-11	100 Ohm Resistor 1 Watt 10%
R-12	100 Ohm Resistor 1 Watt 10%
R-13	1K Ohm Resistor 1 Watt 10%
R-14	3.9K Ohm Resistor 1 Watt 10%
R-15	4.7K Ohm Resistor 1 Watt 10%
R-16	15K Ohm Resistor 1 Watt 10%
R-17	10K Ohm Resistor 2 Watt 10%
R-18	18 Ohm Resistor 3 Watt 10%
R-19	18 Ohm Resistor 3 Watt 10%
R-20	270 Ohm Resistor 5 Watt 10%
R-21	270 Ohm Resistor 5 Watt 10%

Item	Description
R-22	1K Ohm W.W. Load Pot.
P-23	100 Ohm Trimmer Pot.
R-24	1K Ohm Trimmer Pot.
R-25	40 Ohm Trimmer Pot.
V ₁	68J8
M ₁	0.1MA Meter
D ₁	1Y4 Rectifier
C ₁	200-200 mfd 10V
C ₂	100 mfd 25V
C ₃	100 mfd 25V
C ₄	.01 mfd. 600V
C ₅	.01 mfd 600V
C ₆	.01 mfd 600V
C ₇	.05 mfd 600V
B ₁	NE-2 Neon Lamp
B ₂	#44 Lamp
B ₃	#44 Lamp
T ₁	Power Transformer
S ₁	5-pol. 4 pos Function Switch
S ₂	1-pol. 12 pos Selector Switch
S ₃	13-Sect. Lever Switch

SERVICE NOTES

1. The calibration controls of your Model 1000 are factory-set, and should not require further adjustment. If these controls are tampered with, your instrument will require factory re-calibration.
2. The POWER indicator, part no. B₃, is one of a pair of type 44 lamp bulbs which regulate the mutual conductance circuit. Should either bulb become burned out, it must be replaced at once or the Gm test circuit will not operate.

